Ph.D. Synopsis on

Need for Clean and Green Energy

(A Study with Special reference to India Since 2014)

Submitted to: -

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Pat:2021-22

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TITLE OF THE RESEARCH WORK

Need for Clean and Green Energy

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STATEMENT OF THE RESEARCH PROBLEM

The model of development we are pursuing is heavily dependent on the increasing use of energy. Most of the energy currently generated in the world is from non–renewable sources like coal or petroleum. At the same time, the long-term use of fossil energy has created new energy security problems. Firstly, the exploitation and utilization of fossil fuels have caused serious ecological damages, and the greenhouse gas emissions (GHGs) from their combustion are the primary cause of climate change. Climate change and energy security are key drivers of future energy policy, and future policymakers face multiple challenges to develop policies that are cost-effective, secure energy systems and reduce GHGs. Secondly, the energy system with fossil energy as the core also exacerbates economic and energy inequality. Ensuring access to affordable, reliable and sustainable modern energy for all is one of the 17 United Nations Sustainable Development Goals (UN SDG).

- Can energy transition of India fulfill the energy security?
- Does India need to import clean and green technologies from other country?
- What is the diplomatic actions and initiatives of India to energy?
- Does climate change need energy efficiency and clean and green energy transition?

RESEARCH COVERAGE: THEME AND AREA

Currently, India is the most populated countries in the world. It has been predicted that India's economic growth will trigger its population's demand for energy more and more. International Energy Agency (IEA) states that India's electricity demand doubled as economic growth improved the quality of life of Indians. In this situation, India's energy security concerns rise due to its young population. The socio-economic purchase power will naturally contribute to demand more quality in their daily life such as home appliances like air conditioning, refrigerator, etc.

One needs to highlight that India's energy transition is a multifaceted process requiring extensive economic and high-tech resources as well as applicable innovation for the variety of sectors of power, industry, transport, and household. The usage of coal, the dirtiest fuel source, is at the core of the environmental concerns in India, while the share of renewables is increasing thanks to feasibility.

India's energy transition is also essential because of three dimensions. These are respectively *environmental, economic, and security*. If India can achieve to mitigate its carbon emissions, it's also beneficial for the world. In this context, the transition from conventional to non-conventional energy can play an important role. Currently, coal dominates India's energy mix

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and creates carbon emissions. However, India's the draft National Energy Policy foresees its replacement with natural gas and renewables, motivated by concerns about climate change and air pollution, and improves energy security by using low-carbon resources such as hydrogen, wind and solar.

NITI Aayog plays a leading role in India's energy policy planning, and it highlights the importance of energy as a primary input for India's development. *The National Energy Policy (NEP) of India set four key objectives: providing secure, continuous, affordable, and sustainable energy to achieve sustainable development in India.* On the one hand, goals related to accessibility and affordability issues are regarding electricity distribution to all. When one evaluates the socio-economic status of India's population, power distribution for all at affordable prices is a vital issue. On the other hand, achieving energy security through low-carbon energy resources would assist India to lessen its energy dependence. This depends on the extent India can diversify its oil, gas and coal imports coupling with the exploitation of natural and domestic assets through renewables, hydroelectricity, nuclear, and coal. The energy efficiency investments and policy implementations can also mitigate the energy dependence of India. Demand-side policies focusing on household energy consumption for lighting, heating and cooling are essential to accomplish this task. Environmental concerns related to carbon emission because of fossil fuels are at the heart of world politics. As a rising star of Asia, India, a strong candidate for global leadership, must cope with the adverse effects of fossil fuels on carbon emissions and hazardous air quality. In this case, reducing fossil fuel imports in the energy mix of India would address both energy security and towards carbon neutral economy commitment.

Last but not least, the locomotive of any state aiming to reach the position of global power economy. To fuel the economy, India needs abundant energy. As a developing country, India has double-digit economic growth goals for rapid development in several sectors. Distributing power would support poverty eradication, resulting in better welfare and living standards for India's citizens. Hence, it would positively affect the overall economic activity of the state.

Mittra also stated that "While India is committed to promoting environmental sustainability, it is struggling to balance such goals with its pursuit of economic growth. As a developing country, India faces capacity problems to distribute power to all of its citizens. Mittra claimed that "The country suffers from energy poverty, with large populations lacking access to modern power sources and dependent instead on wood, biomass and other non-conventional fuels for their basic needs. The usage of these traditional resources increases air pollution that raises environmental concerns.

In line with the Prime Minister's announcement at COP26, Ministry of New and Renewable Energy is working towards achieving 500 GW Non-Fossil based electricity generation capacity by 2030. RE capacity of about 13.5 GW is expected to be installed during calendar year 2023, corresponding to an investment of about ₹ 74,000 crores.

India stands 4th globally in Renewable Energy Installed Capacity, 4th in Wind Power capacity and 5th in Solar Power capacity (as per International Renewable Energy Agency - Renewable capacity statistics 2023).

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National Green Hydrogen Mission: -

The Ministry of New and Renewable Energy is implementing the National Green Hydrogen Mission, approved by the Union Cabinet on 4th January 2023, with an outlay of ₹ 19,744 crore. The overarching objective of the Mission is to make India the Global Hub for production, usage and export of Green Hydrogen and its derivatives.

6th Assembly of International Solar Alliance: -

The 6th Session of the ISA Assembly was held on October 31, 2023 at Bharat Mandapam, Pragati Maidan. The Assembly was presided over by Hon'ble Minister of New & Renewable Energy and Power in his capacity as President ISA.

PM KUSUM: -

The Government approved the expansion of PM KUSUM Scheme with revised targets of 49 lakhs pumps to be installed / solarized under Component B and C of the Scheme.

Rooftop Solar: -

About 741 MW capacity has been installed under the grid connected rooftop solar programme during January to November 2023. An additional approximately 2.77 GW capacity has been installed in all sectors with or without Central Financial Assistance during this period.

Bioenergy: -

Initiative was undertaken for spreading the message of not burning biomass and using it for Bioenergy conversion, in 20 districts of Punjab, Haryana and Uttar Pradesh through BioCNG driven Vans. 105 MWeq capacity of Bioenergy Projects (Biomass and Waste to Energy projects) was installed during the year.

Renewable Purchase Obligation (RPO): -

Government of India has notified the renewable purchase obligation (RPO) targets for designated consumers up to March 2030 under the Energy Conservation Act, 2001.

The minimum share of renewable energy is set to progressively increase over the years. In 2024-25, 29.91 per cent of the total energy must come from renewable energy sources. This will gradually rise to 43.33 per cent in 2029-30.

International Renewable Energy Agency Presidency: -

India assumed the Presidency of the 13th Assembly of The International Renewable Energy Agency (IRENA), the first international organisation to focus exclusively on Renewable Energy, in the meeting held on 14-15 January, 2023 in Abu Dhabi.

"Offshore Wind Energy Lease Rules, 2023" notified to regulate allocation of offshore wind sea blocks to developers

Green Energy Corridor - Inter-State Transmission System for 13 GW RE Projects in Ladakh.

PLI Scheme for High Efficiency Solar PV Modules.

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	Category	Installed Generation Capacity (MW)	% Share in Total
Fossil Fuel	Coal	2,04,435	49.7%
	Lignite	6,620	1.6%
	Gas	24,824	6.0%
	Diesel	589	0.1%
	Total Fossil Fuel :	**2,36,469**	**57.4%**
Non-Fossil Fuel	RES (Incl. Hydro)	1,68,400	11.4%
	Hydro	46,850	29.5%
	Wind, Solar & Other RE	1,21,550	10.2%
	Wind	41,983	15.5%
	Solar	63,894	2.5%
	BM Power/Cogen.	10,210	0.1%
	Waste to Energy	523	1.2%
	Small Hydro Power	4,940	1.6%
	Nuclear	**6,780**	**42.6%**
	Total Non-Fossil Fuel :	**1,75,180**	**42.6%**
	Total Installed Capacity (Fossil Fuel & Non-Fossil Fuel)	**4,11,649**	**100%**

The List of Power Plants Commissioned during 2020-21, 2021-22 and 2022-23 (upto December) is at Annex.

Source: - Ministry of Power (Annual Report 2022-23, page-15,16)

REVIEW OF LITERATURE

Books

Vaclav Smil (2016) in his book ***"Energy Transitions: Global and National Perspectives"*** provides a detailed, global examination of energy transitions, supplying a long-term historical perspective, an up-to-date assessment of recent and near-term advances in energy production technology and implementation, and an explanation of why efforts to limit global warming and to shift away from fossil fuels have been gradual. Based on the best international and national statistical sources, the second edition of Energy Transitions: Global and National Perspectives supplies an in-depth evaluation of how economies and nations around the world are striving to move away from traditional energy sources, the unfolding decarbonisation process, and problems with intermittent energies and national transition plans. It supplies readers with a clear introduction to the basic properties of energy systems and key concepts of their appraisal, puts energy transition patterns in long-term historical perspective, and looks at the energy transition in eight of the world's leading economies. The last chapters focus on the advances in the decarbonisation of the global energy supply and consider how the energy transition will continue in the coming decades.

Girijesh Pant (2015) in his work ***"India's Emerging Energy Relations: Issues and Challenges"*** analyses the role of energy in Indian foreign policy, particularly in defining bilateral relations. It also focuses on the critical gaps in conceptualizing its formulations and recommends a framework for sustainable energy security. India, the fourth largest consumer of oil, is an energy-deficit economy, importing more than eighty percent of its needs. This makes securing energy integral to its foreign policy goals. Obviously it is important for India to actively participate in the global energy market and establish robust, enduring and nuanced

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diplomatic relations with energy exporting countries. Equally important is that India diversifies its energy mix and moves towards carbon-free growth. Renewable energy is today high on the global energy agenda. Indian energy policy thus has to address a range of issues, domestically and on foreign turf. It has to move beyond the transactional mode by creating equity in the global energy industry.

Ashok Sharma (2019) in his book ***"India's Pursuit of Energy Security: Domestic Measures, Foreign Policy and Geopolitics"*** writes the world's energy demand has risen by 95 percent in the past 30 years. In the next 15 years, it is believed to grow by 33% and in the following 20 years by 45%. The great increase in demand from China and India will be accountable for much of the growth. Lots of predictions have already been made about China's future energy needs, the second largest energy market in the world after the US. His paper explores the power resources and needs of India, especially with regard to oil and natural gas. It investigates India's actions to address the on-going fuel crisis and secure supply through diversification. He examines the present renewable power strategy in India, including nuclear power, and concludes with certain policy recommendations. He finds out that in the last decade of the 20th century, competition between China and India has given the two Countries a chain of new partnerships abroad to meet their energy needs.

Yergin (1991) has done commendable work on Energy Security in his work ***"The Prize: The Epic Quest for Oil, Money, and Power"***, the author has tried to focus on Energy Security that emerged as a concept during the First World War for supplying oil for armies. But the introduction of "energy security" as a concept in academics became popular only in the 1960s, e.g. Lubell started writing about energy supply in this period. Expressed his concerns toward the threat for European countries due to increasing global oil consumption. The whole notion of energy security was on its peak among the academicians and policymakers across the globe during the global oil crisis of 1973. He has started Cambridge energy research associates to gather the attention of the world towards the oil supplies and related security concern.

John Michael Armstrong (2021) in his work ***"The Future of Energy: The 2021 guide to the energy transition"*** is written to be accessible for anyone interested in learning more about energy. Substantially updated in 2021 to reflect the impact of Covid-19 on the world of energy, the book takes the reader through a future for energy generation, transportation, and utilisation. Concise and comprehensive, the book brings together discussion on energy and thoughts on the range of topics which form the fulcrum of the challenges ahead of us including climate change, hydrogen, heat, sustainability, and renewable energy. Written to spark ideas, discussion and debate the 'Future of Energy' engages the reader in the future challenges and opportunities of this hugely exciting and important field.

Articles

Sonali Mittra in her article ***"India's Energy Transition in a Climate-Constrained World"*** [New Delhi: Observer Research Foundation (ORF), November 2015, no. 116] writes the Energy transitions in developing economies like India are complex processes involving substantial financial and technological resources as well as appropriate innovation. These transitions are central to the climate debate, where emphasis is placed on increasing the share

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of renewables in the energy mix to mitigate the adverse impacts of climate change. This paper examines the historical attributes of energy transition and finds various critical factors that determine the success of such shift: appropriate IPR regimes; local innovation; economic feasibility of the energy resource; and affordability of end-users. These, in turn, are interlinked with socio-political and economic processes of development. In all, suitable support from national and global communities is required to build local innovation capacities, encourage advancement of energy technologies, and allow for the rethinking of income-growth models to transition towards environmentally benign energy resources.

Junfeng Li and Siyu Jiang in their article ***"Energy security in the era of transition"*** [Global Energy Interconnection Volume 2, Issue 5, October 2019, Pages 375-37] write about a systematic transition towards low-carbon, clean energy from fossil fuels is the key to addressing the new energy security challenges. This is mainly because the energy transition promotes three major shifts that strengthen energy security. The development mode shifts from resource dependence to technology dependence, laying a material foundation for common energy security; energy production shifts from mineral mining to equipment manufacturing, stimulating a new economic vitality; conventional energy consumption mode enters into the era of electrification, ensuring the sustainable energy security.

Aleh Cherp and Jessica Jewell in their article ***"The concept of energy security: Beyond the four As"*** [Science Direct: Elsevier, Energy Policy Volume 75, December 2014, Pages 415-421] write the Energy security studies have expanded from their classic beginnings following the 1970s oil crises to encompass various energy sectors and increasingly diverse issues. This viewpoint contributes to the re-examination of the meaning of energy security that has accompanied this expansion. Our starting point is that energy security is an instance of security in general and thus any concept of it should address three questions: "Security for whom?", "Security for which values?" and "Security from what threats?" We examine an influential approach – the 'four As of energy security' (availability, accessibility, affordability, and acceptability) and related literature of energy security – to show it does not address these questions. We subsequently summarize recent insights which propose a different concept of energy security as 'low vulnerability of vital energy systems'. This approach opens the road for detailed exploration of vulnerabilities as a combination of exposure to risks and resilience and of the links between vital energy systems and critical social functions. The examination of energy security framed by this concept involves several scientific disciplines and provides a useful platform for scholarly analysis and policy learning.

International Energy Agency (IEA) in its report ***"Security of Clean Energy Transitions"*** [IEA (2021), Security of Clean Energy Transitions, IEA, Paris https://www.iea.org/reports/security-of-clean-energy-transitions-2, License: CC BY 4.0] This report examines the evolving nature of energy security in the context of clean energy transitions in general and on the pathway to net-zero emissions in particular. It highlights emerging energy security concerns and provides recommendations to foster international collaboration, notably within the Group of Twenty (G20). In the context of Italy's G20 presidency, its Ministry of Economic Development requested the International Energy Agency (IEA) to undertake this Security of Clean Energy Transitions report. It aims to support discussions among the G20 countries and to provide insights and direction for the review and update of the G20 energy collaboration principles, which were endorsed at the G20 Brisbane Leaders' Summit in 2014.

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OBJECTIVES OF THE RESEARCH

- To analyze the problems of energy crisis and meager resource of 'Energy' for a developing nation like India and the effort of Policy makers in doing away the 'Energy crunch'.
- To investigate the relation between energy security and Foreign Policy.
- To explore ways and means to meet SDGs.
- To make the comparative analysis of the policies of NDA regime, with reference to their policies and capabilities to shape India's Foreign policy and energy security as its essential constituent for the development.
- To explore the success of government's diplomatic actions and initiatives to deal with the problems of Energy crisis and resource crunch in India.

RESEARCH HYPOTHESES

- Energy security is sine qua non for India's emergence as a global power.
- India is pursuing clean and green energy to address climate change and reduce dependence on fuel imports.
- Improved energy efficiency measures with adequate green transition in all sectors can ensure energy security of the nation.
- Importing green technology from other country like China, USA is to meet SDGs.
- The growing energy demand and the energy poverty of the huge section of the people are the major challenges in India's energy landscape.

CONTRIBUTIONS OF THE RESEARCH WORK TO THE DISCIPLINE AND ALLIED DISCIPLINES

This study aims to promote the production of energy through the use of clean and green energy sources in accordance with climate, environment and macroeconomic considerations in order to reduce dependence on fossil fuels, ensure security of supply and reduce emissions of CO2 and other greenhouse gases. This research shall in particular contribute to ensuring fulfillment of national and international objectives on increasing the proportion of energy produced

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through the use of renewable energy sources. The study would be beneficial to Green Politics, Environmental studies, International Relation, Public Administration, History and so on.

METHODOLOGICAL APPROACH

Research is a scientific plan hence any attempt to research demands a specific methodology. The proposed research work is theoretical in nature hence secondary cum primary sources of data collection have been focused. The methods applied in the proposed research are-

Analytical - By this method the data and information's are analyzed to give a critical assessment of the facts.

Comparative - This method has been utilized to highlight the differences created by the government at different time frames.

Qualitative - These methods explain the concept, values and patterns observed in the area after analyzing the facts.

Quantitative method - This is absolute necessity to assesses the energy security, thus a complete data evaluation has been done in quantitative term to give factual basis to any assessment.

Reference books, Library consultation, Statistical data derived from government agencies, National and international sources, Internet, research articles, major and minor reports of the Government regarding the subject and the literature in an around the subject concern has been widely explored during the tenure of this research.

Data collection mainly includes Government reports and analysis from various related ministries, reports especially annual reports and white paper needed for the study. Various reports from related think tanks and conversations with the experts have been utilized in the process.

Graphical depiction of data has been used at various places to depict the similarities, differences, deviations.

WORK DESIGN: TENTATIVE PLAN OF THE WORK

Chapter I: Introduction

Chapter II: Internal and External Factors Responsible for Clean and Green Energy

Chapter III: Possibilities for Green Energy Transition of India

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Chapter IV: Indian Policy of Energy Security

Chapter V: Conclusion

BIBLIOGRAPHY

Primary Sources

MNRE. Annual Report 2020-21. MNRE, 2021. https://mnre.gov.in/img/documents/uploads/file_f-1618564141288.pdf

India's Renewable Energy Act 2015, accessed January 3, 2020, https://mnre.gov.in/knowledge-center/repor

Lok Sabha Secretariat. Seventeenth Report of Standing Committee on Energy (2020-21): MNRE Action Plan for Achievement of 175 Gigawatt (GW) Renewable Energy Target. Seventeenth Lok Sabha; Lok Sabha Secretariat, March 2021. http://164.100.47.193/lsscommittee/Energy/17 Energy_17.pdf.

Make in India. https://www.makeinindia.com/sector/renewable-energy accessed June 7, 2021.

IEA. Renewables Integration in India. Paris: International Energy Agency: 2021. https://iea.blob.core.windows.net/assets/7b6bf9e6-4d69-466c-8069 bdd26b3e9ed1/RenewablesIntegrationinIndia2021.pdf

Coal 2020. Paris: International Energy Agency, 2020.

Global Energy Review 2020. Paris: International Energy Agency, 2020.

India 2020 Energy Policy Review. Paris: International Energy Agency, 2020.

India Energy Outlook 2015. Paris: International Energy Agency, 2015.

India Energy Outlook 2021.Paris: International Energy Agency, 2021.https://iea.blob.core.windows.net/assets/1de6d91e-e23f-4e02-b1fb- 51fdd6283b22/India Energy Outlook 2021.pdf

Energy security outlook defining a secure and sustainable energy future in India (2015). The Energy and Resources Institute (TERI). Retrieved from. http://bookstore.teri.res.in/docs/books/ENERGY%20SECURITY%20OUTLOOK.pdf

https://pib.gov.in/PressReleasePage.aspx?PRID=1992732

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Secondary sources

Books

Sikri, R. (2009). Challenge and strategy: rethinking India's foreign policy. Sage Publications India.

Yergin, D. (1990). The Prize: the epic quest for oil, money, power. Simon and Schuster.

Pant, G. (2015). India's emerging energy relations. Springer New Delhi.

Yergin, D. (2011). The quest: Energy security and the remaking of the modern world. United states: Penguin press

Stern, D. (2004). Economic growth and energy. Encyclopedia of energy 2, 35-51.

Daniel, Y. (2011). The Quest: Energy, Security and Remaking of the Modern World.

Lubell, H. (1961). Security of supply and energy policy in Western Europe. World Politics, 13(3), 400-422.

Smil, Vaclav. (2016). Energy Transitions: Global and National Perspectives. Praeger Publishers Inc; 2nd edition

Sharma, Ashok. (2019). India's Pursuit of Energy Security: Domestic Measures, Foreign Policy and Geopolitics. Sage Publications India.

Armstrong, Michael, John. (2021). The Future of Energy: The 2021 guide to the energy transition. Energy Technology Publishing

Articles

Mittra, Sonali. (2015). India's Energy Transition in a Climate-Constrained World. New Delhi: Observer Research Foundation, no. 116

Li, Junfeng and Jiang, Siyu. (2019). Energy security in the era of transition. Global Energy Interconnection

Cherp, Aleh and Jewell, Jessica. (2014). The concept of energy security: Beyond the four As. Science Direct: Elsevier

Manberger, Andre and Johansson, Benget. (2019). The geopolitics of metals and metalloids used for the renewable energy transition. Elsevier

Jones, Jonathan Spancer. (2021). India's smart meter rollout – 250 million meters by 2025, Smart Energy International

Pant, Girijesh. (2008). India: The Emerging Energy Player. New Delhi: Pearson Longman. 302 pp.

MB Verma 20.04.2024

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